



**Accelerating Innovation and Discovery at ARL and Beyond**

**Dr. Thomas Russell**  
Director  
**U.S. Army Research Laboratory**



# The Future Army's Emerging Path Forward

## Deep Future (Could Do + Should Do)

Revolutionary, concept-based, technology informed investments to build an Army that is ...

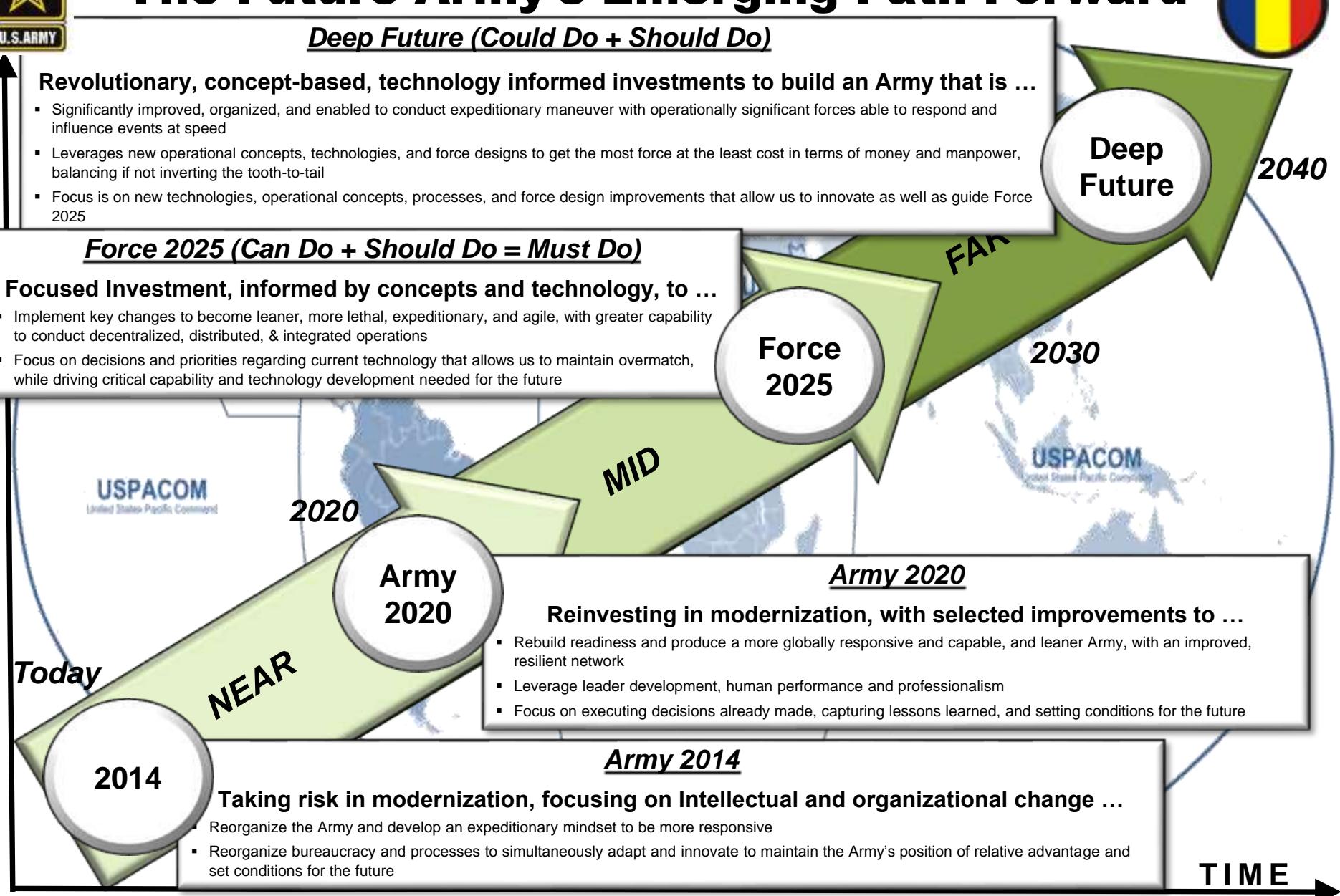
- Significantly improved, organized, and enabled to conduct expeditionary maneuver with operationally significant forces able to respond and influence events at speed
- Leverages new operational concepts, technologies, and force designs to get the most force at the least cost in terms of money and manpower, balancing if not inverting the tooth-to-tail
- Focus is on new technologies, operational concepts, processes, and force design improvements that allow us to innovate as well as guide Force 2025

## Force 2025 (Can Do + Should Do = Must Do)

Focused Investment, informed by concepts and technology, to ...

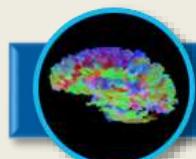
- Implement key changes to become leaner, more lethal, expeditionary, and agile, with greater capability to conduct decentralized, distributed, & integrated operations
- Focus on decisions and priorities regarding current technology that allows us to maintain overmatch, while driving critical capability and technology development needed for the future

CAPABILITY





**Extramural Basic Research**  
Spearheading and overseeing of the systematic study to increase the utility of basic research to long-term national security needs.



## Human Sciences

Fundamental understanding of Warfighter performance enhancement, training aids, and man-machine integration..



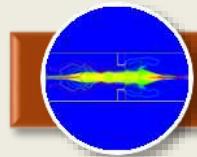
## Information Sciences

Fundamental understanding of information generation, collection, assurance, distribution, and exploitation.



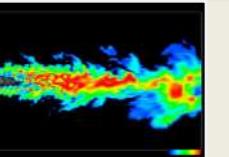
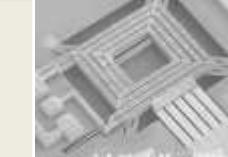
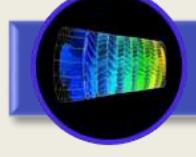
## Sciences for Lethality & Protection

Fundamental understanding of emerging technologies that support weapon systems, protection systems, and injury mechanisms affecting the Warfighter



## Sciences for Maneuver

Fundamental understanding of the design, integration, control, and exploitation of highly adaptive platforms in complex environments



open  
end



## Materials Research

Fundamental understanding of structural, electronic, photonic, and energy materials & devices.

## Computational Sciences

Fundamental understanding of computer hardware, high efficiency algorithms, and novel mathematical methods.

**Assessment and Analysis**  
Quantitatively Assess the development and application of analytical tools and methodologies to quantitatively assess the military utility of Army, DoD, and select foreign combat systems.



U.S. ARMY  
**RDECOM**

UNCLASSIFIED

## Benefits for Participation

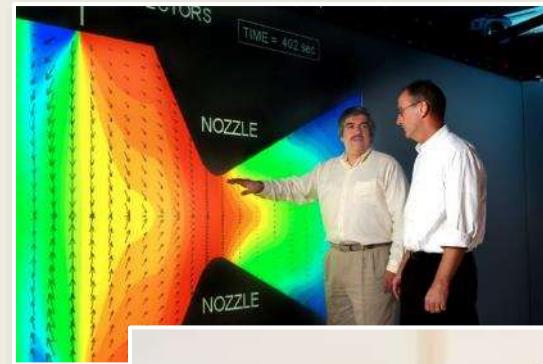
**ARL**  
open  
campus

### Critical Member of S&T Ecosystem with DoD, Academia, Industry and Small Business

- Build awareness of Army S&T problems in the national conversation on security, defense, science, and education
- Develop a joint workforce with flexible career options
- Enhance employment potential
- Attract new staff/faculty by access to collaborative network
- Strengthen academic programs in the sciences, engineering, and mathematics
- Introduce Small Businesses to ARL scientists & engineers

### Align & Leverage Resources

- Expertise, facilities, capabilities and perspectives
- Access to real data for enhanced simulation and emulation, e.g. of cyber and mobile networking domains
- Inform R&D for improved Army system integration by collaboration with Industry
- Ensure rapid technology transition to the marketplace
- Opportunities to shape technology maturation timelines





## Rate-Activated Tether for Reduction in Ground Impact-Induced TBI

- Collaboration with NFL/Under Armour/GE/ARL
- Concept: Use tether to reduce head velocity during backward falls, and severity of head-to-ground impact
- Rate-activated tether provides over 100X more force during high speed extension, compared to low speed extension

ARL POC: Eric Wetzel (Material Sciences)



## Information Exploitation Research

- Research to develop analytical solutions to manage uncertainty, speed contextualization, and assist reasoning across multiple sources of information to promote accurate situational awareness.
- ARL and LM(ATL) will endeavor to exploit open source information, characterize the value of information from an analyst's perspective, and research advance assisted-reasoning techniques.
- Predictive Analytics
- Characterization of Information
- Exploitation of Open Source / Social Media
- Army Intelligence for Megacities

ARL POC: Tim Hanratty (Information Sciences) / Kevin Barry LM(ATL)





U.S. ARMY  
**RDECOM**

UNCLASSIFIED

# Collaborative Academic Research

**ARL**  
open  
campus

## Research Exchanges:

### Prof. Patrick Mather, Syracuse University (*Material Sciences*)

- One year sabbatical at ARL to investigate the rate dependent mechanics of polymer blends
- Exploring the processing-structure-mechanics relationships in novel phase separating polymer blends
- Modeling the polymer blends with well controlled chemistry, composition, and morphology.

### Dr. Steven Keller, ARL (*Material Sciences*)

- Three year detail at UMass Amherst
- Investigating feasibility of textile-integrated carbon nanotube antenna fabrication with U. Cincinnati
- Collaboration with NSRDEC and UMass (Amherst and Lowell) on conductive textile and flexible antenna research and fabrication

### Cyber Collaborative Research Alliance with Penn State (*Info Sciences*)

- 20 graduate and undergraduate researcher have completed a research experience at ARL
- 5 undergraduate students hired through pathways program

## Expanding the Ecosystem:

### ARL West (*Human Sciences and Information Sciences*)

- Local hub for west coast university interactions & recruitment
- Leverage ongoing research at ICT & USC Information Sciences Institute
- ARL-distinct facilities are available at the USC Institute for Collaborative Technology (ICT) UARC
- Excellent potential for increased innovation through closer collaboration with USC & ICT research staff





**U.S. ARMY  
RDECOM®**

UNCLASSIFIED

## Expanding the Network Internationally

**ARL**  
open  
campus

### SIGNED



ЧЕРНІГІВСЬКИЙ ДЕРЖАВНИЙ  
ТЕХНОЛОГІЧНИЙ УНІВЕРСИТЕТ

Chernihiv National University of  
Technology – Ukraine  
POC: Dr. Alexander Kott  
CRADA in Information Sciences



National Technical University of  
Ukraine - "Kyiv Polytechnic Institute"  
POC: Dr. Alexander Kott  
CRADA in Information Sciences



Australian National University  
Australia  
POC: Dr. James Carroll  
CRADA in Materials Research



University of Oslo  
Norway  
POC: Dr. Lance Kaplan  
CRADA in Information Sciences

### IN PROCESS



**NANYANG  
TECHNOLOGICAL  
UNIVERSITY**

Nanyang Technical University  
Singapore  
POC: Dr. Govind Mallick  
CRADA in Materials Research



**UNIVERSITY OF  
ALBERTA**

University of Alberta  
Canada  
POC: Tomoko Sano  
CRADA in Material Sciences



**THE UNIVERSITY OF  
SYDNEY**

University of Sydney  
Australia  
POC: Dr. Weimin Zhou  
CRADA in Materials Research



Warsaw University of Technology  
Poland  
POC: Dr. Angelique Scharine  
CRADA in Human Sciences

The Nation's Premier Laboratory for Land Forces

UNCLASSIFIED



U.S. ARMY  
**RDECOM**

UNCLASSIFIED

## ARL's New Research Centers

**ARL**  
open  
campus

# Aberdeen Proving Ground, MD



## Adelphi, MD

Army Cyber Research Center  
Intelligent Systems Research Center (APG/ALC)  
Center for Research in Extreme Batteries  
Network Science Research Center  
Specialty Electronics Center

## White Sands Missile Range, NM

Atmospheric Sciences Center

## Orlando Florida

Simulation and Training Technology Center

The Nation's Premier Laboratory for Land Forces

UNCLASSIFIED



U.S. ARMY  
**RDECOM**

**ARL**  
open  
campus

# Backups

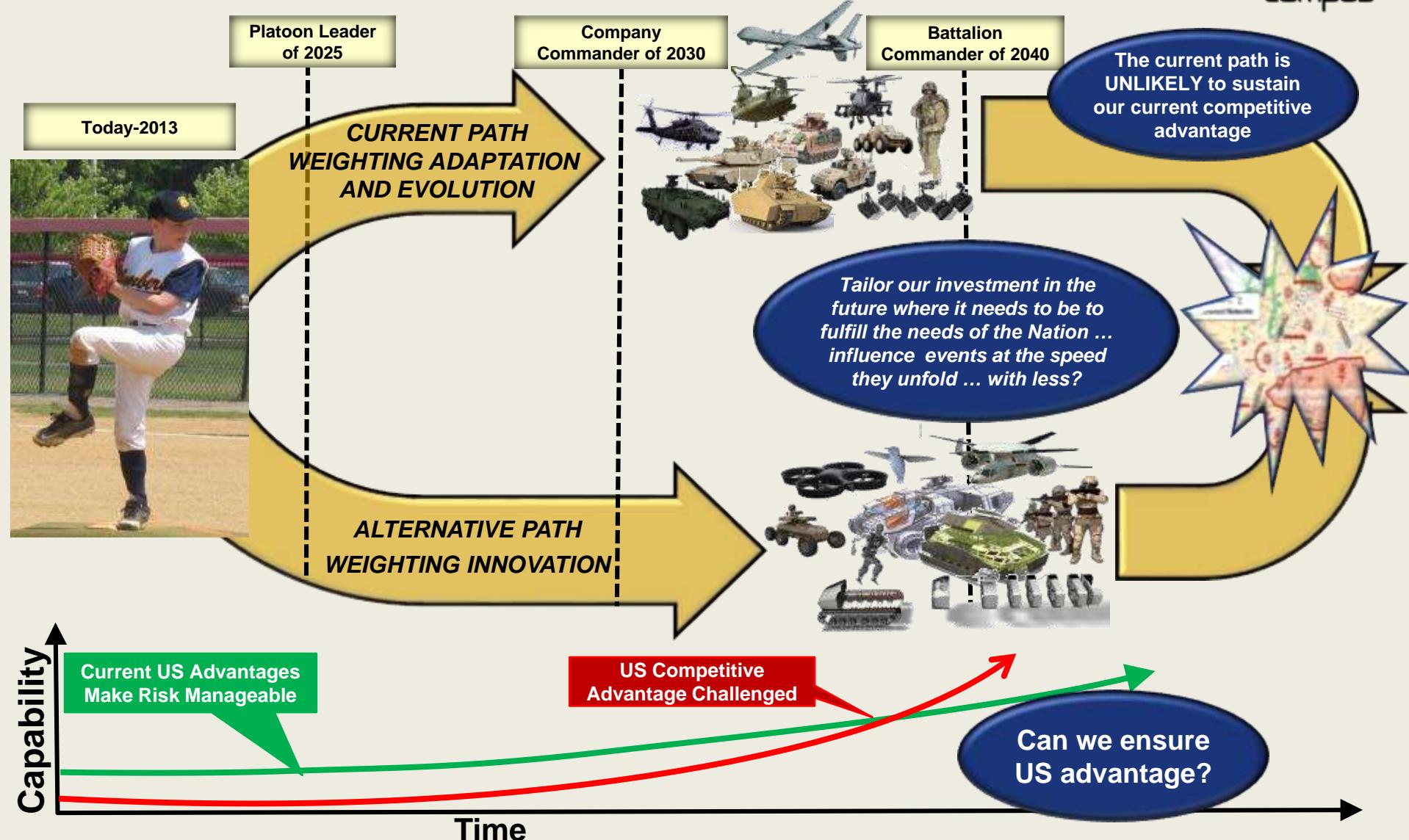


U.S. ARMY  
**RDECOM**

UNCLASSIFIED

# Will Today's Investments Secure the Future?

ARL  
open  
campus

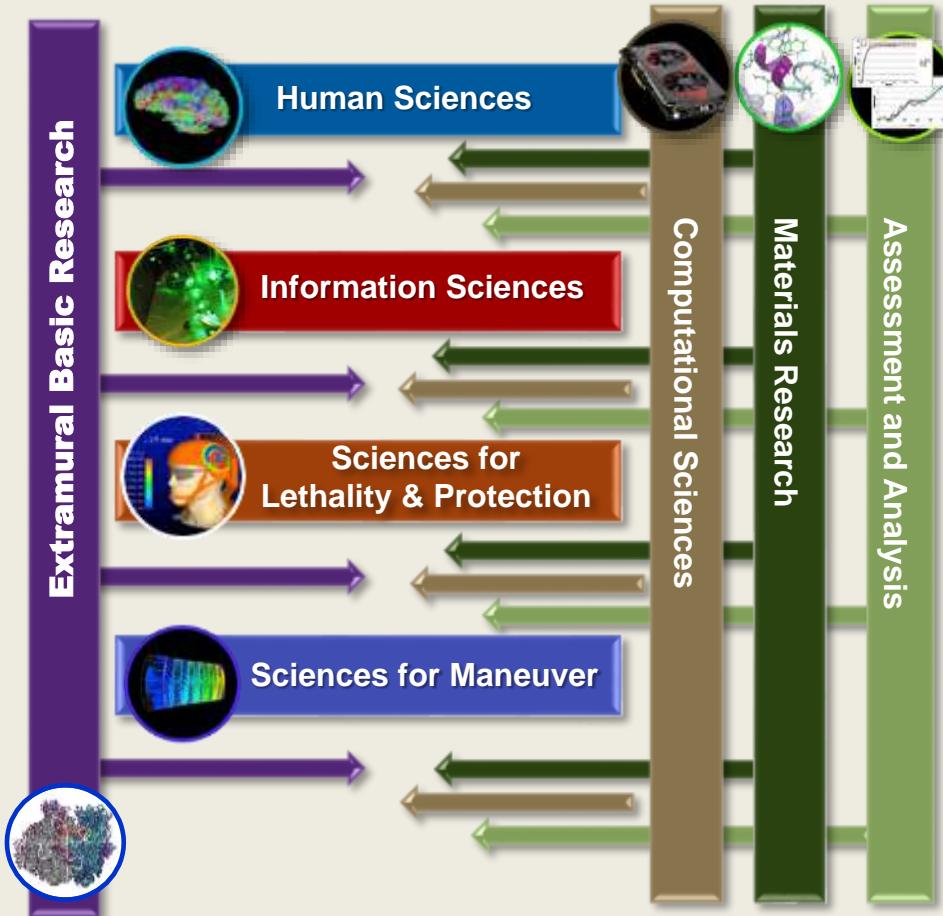


The Nation's Premier Laboratory for Land Forces

UNCLASSIFIED



## S&T Campaign Plans



## Open Campus Business Model



<http://www.arl.army.mil/publications>